

## PATENT ABSTRACTS OF JAPAN

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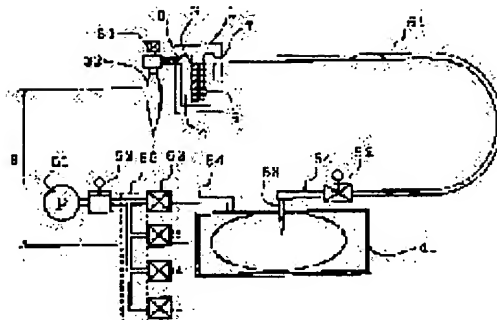
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## (54) INK JET RECORDING APPARATUS AND VALVE MECHANISM

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a highly reliable ink jet recording apparatus by preventing trouble such as the fixing of a sub-tank film or the clogging of a passage even when a circulating type ink jet recording apparatus is allowed to stand over a long period of time.

**SOLUTION:** A flexible supply tube 51 is connected to the ink supply port 7 on the side of a cartridge 41 and a passage valve 52 being a valve means is connected to the other end of the supply tube 51. The passage valve 52 is further connected to an ink cartridge 41 through a tube 54 and a tubular needle 53. An air pump 61 serving as an ink supply means is branched into four systems through a pressure regulator 62 to be connected to the ink cartridge 41 from changeover valves 63 through air pipes 64.



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**CLAIMS**

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[Claim(s)]

[Claim 1] The ink jet type recording head and subtank which equipped two common ink rooms which are open for free passage on both sides of a pressure generating room, and the ink room of said the community of each with the ink feed hopper which connects with the exterior, respectively are carried in carriage. Moreover, it sets to the ink jet recording device which comes to prepare the ink cartridge connected by said ink jet type recording head and passage, and an ink supply means to feed the ink of said ink cartridge, out of said carriage. The ink jet recording device characterized by having a bulb means between a recording head and an ink cartridge.

[Claim 2] The ink jet recording device according to claim 1 with which said bulb means is characterized by being a normal close type solenoid valve.

[Claim 3] The ink jet recording device according to claim 1 with which said bulb means is characterized by operating according to the pressure of an ink supply means to feed ink.

[Claim 4] The valve mechanism of the ink jet recording apparatus according to claim 3 characterized by having the valve portion material which an ink supply means to feed said ink is an air pump, and was arranged in the interior of the passage between the diaphragm connected in said air pump and passage, and a recording head and an ink cartridge, interlocking with [ variation rate / of said diaphragm ] said valve portion material, and displacing.

[Claim 5] The valve mechanism according to claim 4 characterized by arranging two or more valve portion material to a single diaphragm.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the recording device which carries the ink jet head which breathes out an ink droplet and is made to adhere in the record paper, only when record is needed.

[0002] It is concerned with the ink jet recording device of the circuit system which records while supplying ink to a subtank and a recording head through passage from the ink cartridge which carried the ink jet type recording head and the subtank in carriage, and was installed in the box in more detail.

[0003]

[Description of the Prior Art] An ink jet recording apparatus carrying in carriage the ink jet type recording head which carries out the regurgitation of the ink droplet with a pressure generating means, and it printing, receiving makeup of ink from an ink tank, also carrying an ink cartridge in the carriage equipped with the recording head, and attaining simplification of structure is performed.

[0004] In order for dot density to become large by leaps and bounds with improvement in the engine performance of an ink jet type recording head, to, attain color printing with natural color on the other hand and to aim at improvement in much more printing quality, efforts to make the blot on a record medium small as much as possible are made.

[0005] Approaches, such as heating and carrying out film formation of the emulsion which becomes ink from thermoplastics as the one means, and the ink which was made to contain sugar and was breathed out on a record medium, are proposed.

[0006] If it is in ink equipped with such film formation nature Since melting fixation of the emulsion in ink is carried out by heating in addition to the merit that image quality improves substantially since there are very few blots, while it has the merit that an advanced water resisting property is obtained, in order the concentration of the solid content under ink presentation is high and to receive the thermal effect from a heating means further -- viscosity lifting of ink -- or it is easy to produce the instability regurgitation by gassing accompanying temperature up etc.

[0007] Although connecting a recording head, a subtank, and an ink cartridge to endless, and circulating through ink as an approach of canceling such a trouble is also proposed, since two passage of the passage for outward trips and the passage for return trips is needed between a recording head and an ink cartridge, it has the problem that passage structure becomes complicated. Two common ink rooms which these people etc. open for free passage on both sides of the pressure room of a recording head, It has the ink feed hopper by which ink flows into the ink room of each community from the exterior, respectively. One ink feed hopper is connected to a subtank, and the ink feed hopper of another side is connected to the ink cartridge. Make it go via an ink jet type recording head with the supply means of the ink which feeds the ink of an ink cartridge, and ink is pumped up on a subtank. Moreover, the ink jet recording device which was made to print while circulating through ink to an ink cartridge and making the interior of a back run, now a recording head circulate through ink via a recording head from a subtank was proposed.

[0008] According to this, without causing complication of structure, the temperature up of viscosity lifting by the recording head or a recording head can be prevented as much as possible, and stable record can be performed.

[0009]

[Problem(s) to be Solved by the Invention] Since it can be circulated through a subtank by constituting with the flexible film, without foaming also by oscillation of the carriage further accompanying [ there is very little pressure fluctuation and ] record actuation, it has the outstanding merit that record stabilized more can be performed.

[0010] However, in non-operating status, the ink in a subtank will be in the condition that films stuck through few ink layers in order to all flow backwards to an ink cartridge side according to a gravity difference. The technical problem that the ink of passage until lifting of the concentration of the solid content in remaining ink is remarkable when

moisture evaporates through said flexible film in neglect prolonged in this condition etc., and films fix or it results [ from a subtank ] in a head solidifies, and failures, such as jam up \*\*\*\*, arise occurs.

[0011] The place which this invention is made in view of such a technical problem, and is made into the object is offering the ink jet recording device which a failure's does not produce by prolonged neglect, either by making ink remain in a subtank also in the condition of not working.

[0012]

[Means for Solving the Problem] Therefore, two common ink rooms which are open for free passage on both sides of a pressure generating room in this invention, The ink jet type recording head and subtank which equipped the ink room of said the community of each with the ink feed hopper which connects with the exterior, respectively are carried in carriage. Moreover, it sets to the ink jet recording device which comes to prepare the ink cartridge connected by said ink jet type recording head and passage, and an ink supply means to feed the ink of said ink cartridge, out of said carriage. It is characterized by having a bulb means between a recording head and an ink cartridge.

[0013] Moreover, said bulb means is characterized by being a normal close type solenoid valve.

[0014] Moreover, said bulb means is characterized by operating according to the pressure of an ink supply means to feed ink.

[0015] Furthermore, in a valve mechanism, an ink supply means to feed said ink is an air pump, and it has the valve portion material arranged in the interior of the passage between the diaphragm connected in said air pump and passage, and a recording head and an ink cartridge, and is characterized by interlocking with [ variation rate / of said diaphragm ] said valve portion material, and displacing.

[0016] Furthermore, the above-mentioned valve mechanism is characterized by arranging two or more valve portion material to a single diaphragm.

[0017]

[Embodiment of the Invention] Hereafter, the first example of this invention is explained using a drawing.

[0018] Drawing 1 shows the passage configuration of the ink jet recording apparatus of this invention, and drawing 2 shows the structure of the ink jet recording apparatus of this invention. Moreover, drawing 3 and drawing 4 show structural drawing of a subtank part and an ink cartridge part used for this invention, respectively.

[0019] In drawing 2, a recording head 1 and the subtank unit 30 are stopped on carriage 2, and perform a both-way scan by the driving means which is not illustrated (horizontal scanning). The platen 10 arranged in the location which counters a recording head 1 on the other hand rotates by the driving means which is not illustrated, and, on the other hand, conveys in a direction the recording paper 12 which is a record medium (vertical scanning). Synchronizing with the above horizontal scanning and vertical scanning, based on record data, an ink droplet is made to adhere on discharge and the recording paper 12, and predetermined record is performed from a recording head 1.

[0020] While the blot by space is prevented because the front face of the emulsion which is thermoplastics contained in ink fuses and combines the ink droplet recorded on the recording paper 12 while the moisture in ink evaporates quickly in response to the heat supply from the platen 10 heated at the heater 11 which is a heating means, a water resisting property is given.

[0021] In addition to cooling by the ventilating fan which is not illustrated, this heat is cooled by what is made for ink to flow to the recording head 1 interior (ink circulation) although heat transfer is carried out also to the recording head 1 which faces a platen 10 at this time.

[0022] Next, drawing 1 explains the passage configuration of the ink jet recording device of this invention. Although this example is the configuration of performing color record using the ink of four colors, it is the configuration of branching the air from a single air pump to four lines, and performing ink circulation for every system, and shows only one only of lines [ them ] by drawing 1.

[0023] 32 is a subtank and is connected to a recording head 1. The recording head 1 is equipped with the ink feed hoppers 6 and 7 by which ink flows into two common ink rooms 4 and 5 which are open for free passage on both sides of the pressure room 3, and the ink room of each community from the exterior, respectively. According to the pressure differential from which the ink feed hopper 7 of another side is connected to the subtank 32 side again at an ink cartridge 41 side, and one ink feed hopper 6 produces ink between ink rooms, floating (ink circulation) is made via a pressure room.

[0024] The flexible supply tube 51 is connected to the ink feed hopper 7 by the side of a cartridge 41, and the passage bulb 52 which is a bulb means is connected to the other end of the supply tube 51. Opening of traffic of passage is made by energization to an internal solenoid, and the passage bulb 52 of this example consists of the so-called normal close type which has the property that passage is intercepted in the state of un-energizing of solenoid valve.

[0025] The passage bulb 52 is further connected to an ink cartridge 41 via a tube 54 and the tubular needle 53.

[0026] Via a pressure regulator 62, the air pump 61 which is an ink supply means branches to four lines, and is connected to an ink cartridge 41 via the air pipe 64 from the change bulb 63.

[0027] Next, record actuation is explained and it explains to a detail further.

[0028] While performing energization to the passage bulb 52 and carrying out Kaisei of the passage on the occasion of initiation of record actuation, an air pump 61 is operated.

[0029] Circulation actuation of ink is started based on the amount of ink in a subtank henceforth.

[0030] The subtank unit 30 shows the structure to drawing 3 with an exploded view. The subtank 32 is made with the capacity adjustable using the flexible film. 141 is an ink full detector which detects the ink full of the subtank 32, and 142 is an ink low detector which detects INKUEMPTY. Ink full is detected when the amount of [ of the detection plate 140 which is the tabular spring object arranged so that ink full might meet the front face of the subtank 32 ] point intercepts the optical axis of the ink full detector 141 which consists of a photoluminescence photo detector pair.

Moreover, when the ink low detector 142 constituted the optical axis of a photoluminescence photo detector pair on both sides of the subtank 32, the ink of the subtank 32 interior which has light transmission nature decreased in number and the quantity of light to penetrate increased, ink empty \*\*\*\*\* of [ in a subtank ] is carried out.

[0031] When the ink full of a subtank is detected, the energization to the change bulb 63 is turned off by the control circuit which is not illustrated. They are three so-called directional valves as for which the change bulb 63 is opened for free passage by the cartridge side with atmospheric air while opening of traffic with an air pump 61 is made by energization and an air pump side is intercepted at the time of un-energizing. Therefore, atmospheric pressure is opened for free passage to the ink cartridge connected.

[0032] An ink cartridge 41 is the structure where the ink bag 43 is held in the airtight box 42, and the air pipe 64 is connected to the airport section of a box 42, as a sectional view is shown in drawing 4 . Therefore, if the interior of a box 42 becomes atmospheric pressure, since the ink in the ink bag 43 will become equal to atmospheric pressure as much as possible, it has the water head difference shown by H in drawing 1 , and the ink in a subtank flows backwards to a cartridge side via the inside of a recording head while being supplied to a recording head.

[0033] Next, when INKUEMPTY of a subtank is detected, the energization to the change bulb 63 is made, and the box 42 of an ink cartridge is opened for free passage with an air pump 61.

[0034] A pressure is adjusted so that ink may leak and it may not come out of the pressure from an air pump 61 according to an operation of a pressure regulator 62. Since the ink in the ink bag 43 is pressurized by this pressure, while the ink in the ink bag 43 is supplied to a recording head, it is pumped up via the inside of a recording head at a subtank side.

[0035] Henceforth, ink circulation is made by repeating the above-mentioned actuation successively during record actuation.

[0036] The following actuation is performed when a series of record actuation is completed.

[0037] Energization to the change bulb 63 is performed first, ink is pumped up by the subtank 32, when the ink full of a subtank is detected, the energization to the passage bulb 52 is turned off, and the passage between a recording head and an ink cartridge is intercepted. Therefore, ink is stored inside the subtank 32.

[0038] According to this, since ink sufficient in a subtank remains also in prolonged future neglect, even if evaporation of the ink in a subtank arises, solid content concentration lifting is mitigated, and it is prevented effectively that blinding and films therefore fix.

[0039] Since passage is intercepted by it when a power source is disconnected by the reason which is not expected [ interruption to service ] during record actuation since the passage bulb which is furthermore a bulb means consists of a normal close type solenoid valve, operation that ink is held is in a subtank.

[0040] Moreover, since the ink of the amount which corresponds in a subtank at ink full is held also when resuming record actuation again, it also has the merit that record actuation can be started immediately.

[0041] (Other operation gestalten) Drawing 5 shows the passage configuration of the ink jet recording apparatus of the second example of this invention, and shows the structure of a bulb means to drawing 6 .

[0042] It explains using a drawing below.

[0043] Drawing 6 (a) is the exploded view having shown the configuration of the passage bulb 52 used for this example.

[0044] In an example, four passage is arranged in a single unit and same actuation is performed about each system. 154 is a valve, is energized with a spring 153 in the state of usual, and is pressed by packing 154 while a part for a shank is supported by casing 156 possible [ a slide ]. Immobilization of a spring 153 and the free wheel plate 151 with a tube 51 which has the role of connection are fixed to the upper part of casing 156. Moreover, an end connection with the tube 54 which leads to an ink cartridge side is constituted by the casing 156 lower part in one. The flexible film 157 is arranged

by casing 156 lower opening so that path clearance (c shows to drawing 6 (b)) may be constituted to the actuation shaft of a valve 154. Although the flexible film can also use rubber etc., in this example, the flexible film used the laminate film which joined the polyethylene film which is thermoplastics further to the film which vapor-deposited aluminum on the PET film. According to this, it is more effective, when it can join to casing 157 by heat joining and transparency of moisture or air carries out trespass prevention further. Although the passage of ink is formed of the above, since ink flows more nearly up than a lower part as application of pressure shows all over [ a ] drawing, in order that a gas may not remain inside the passage bulb 52, it is suitable. Under the plasticity film 157, it consists of rubber material, covering 159 is arranged through the diaphragm 158 with which the pressure receiving section 161 was formed in one, and a chamber 160 is formed. The airport to a chamber 160 is formed in covering 159 in one. An airport is connected to the branching plate 66 through a by-path pipe 65, as shown in drawing 5 .

[0045] Next, actuation of the passage bulb in this example is explained.

[0046] Since the inside of a chamber 160 is maintained by the atmospheric pressure during a halt of the air pump 61 which is an ink supply means and, as for the actuation shaft of the valve 154 energized by the spring 153, the flexible film 157 and path clearance are maintained, the passage of ink is intercepted. A sectional view shows the condition at this time to drawing 6 (b).

[0047] Next, when an air pump 61 operates, the inside of a chamber 160 is pressurized and a diaphragm 158 receives an equal load with a pressure. This equal load serves as energization force according to the area of the pressure receiving section 161, and a diaphragm 158 displaces, it minds flexible film 157 and is energized by the actuation shaft of a valve 154, and a valve 154 resists the energization force of a spring 153, and moves up, and Kaisei of the passage is carried out. A sectional view shows the condition at this time to drawing 6 (c).

[0048] Therefore, on the occasion of initiation of record actuation, Kaisei of the passage is carried out only in operating an air pump 61, and ink circulation can be performed. Moreover, when record actuation is completed, the passage between a recording head and an ink cartridge is intercepted by suspending an air pump 61.

[0049] Therefore, according to the above-mentioned configuration, a bulb means can be operated according to the pressure of the supply means of ink, and according to this, ink can be stored in a subtank also in non-operating status.

[0050] Moreover, it also has the effectiveness that the passage bulb of two or more systems can be constituted in one, and can be constituted more cheaply.

[0051]

[Effect of the Invention] According to this invention, by arranging a bulb means in the passage between a recording head and an ink cartridge, ink can be made to store in a subtank, and even if it therefore faces prolonged neglect, fixing of films and the blinding of passage can be prevented effectively.

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[Translation done.]

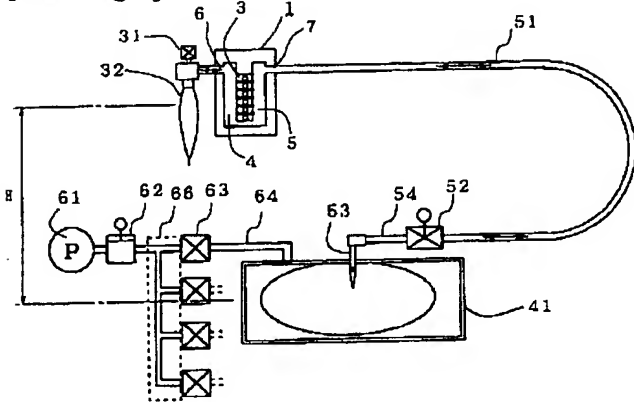
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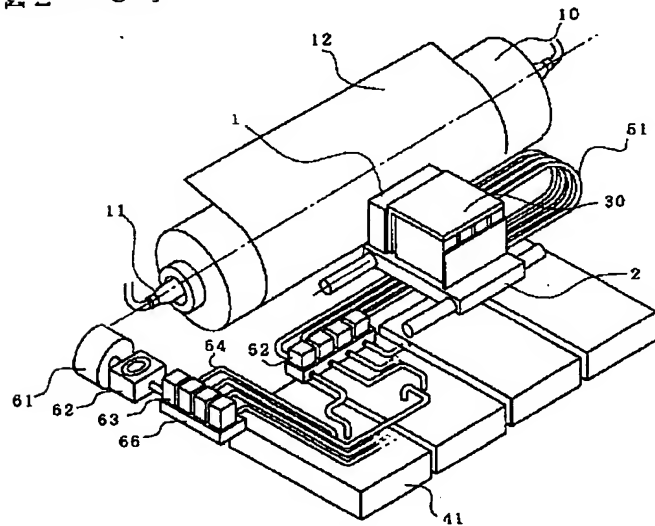
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## DRAWINGS

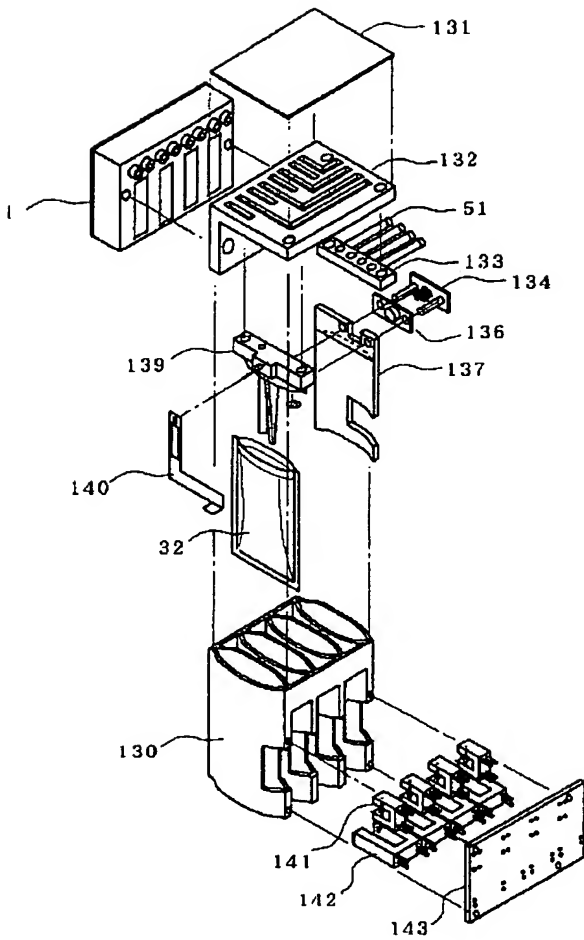
[Drawing 1]



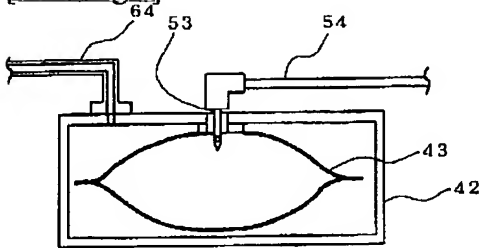
[Drawing 2]



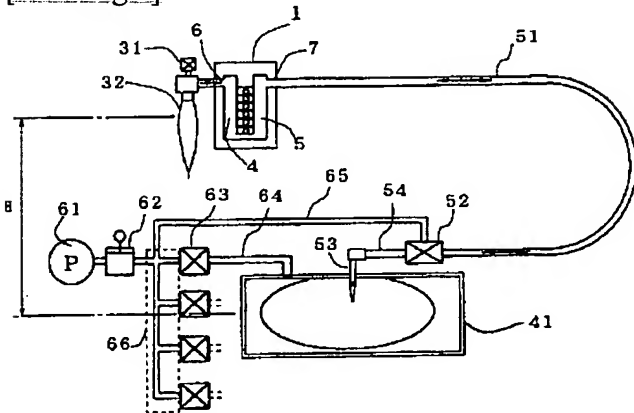
[Drawing 3]



[Drawing 4]

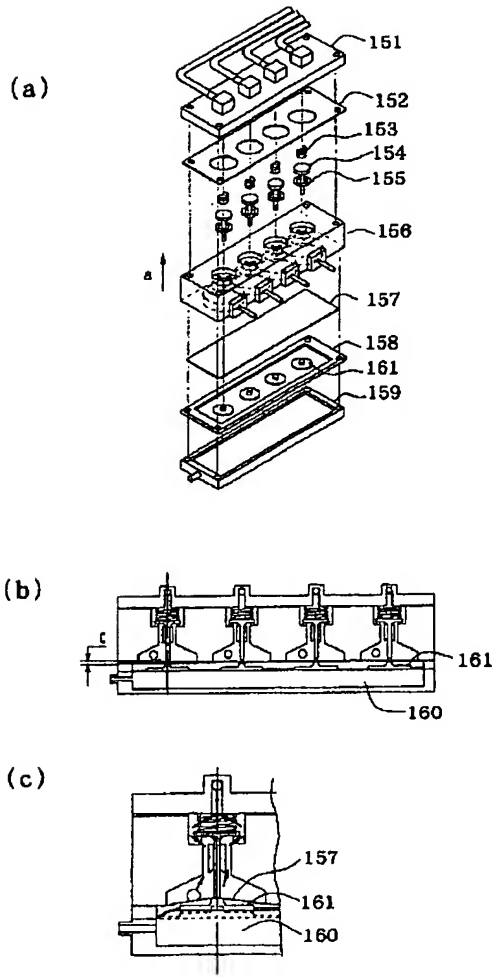


[Drawing 5]

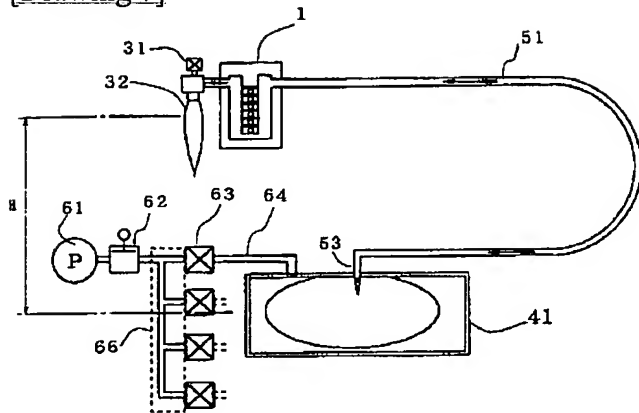


[Drawing 6]





[Drawing 7]



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**CORRECTION OR AMENDMENT**

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B41J 3/04 102 Z

[Procedure amendment]

[Filing Date] May 16, Heisei 12 (2000. 5.16)

[Procedure amendment 1]

[Document to be Amended] Description

[Item(s) to be Amended] Whole sentence

[Method of Amendment] Modification

[Proposed Amendment]

[Document Name] Description

[Title of the Invention] An ink jet recording apparatus and a valve mechanism

[Claim(s)]

[Claim 1] In the ink jet recording device which carries the ink jet type recording head which equipped two common ink rooms which are open for free passage on both sides of a pressure generating room, and the ink room of said the community of each with the ink feed hopper which connects with the exterior, respectively, and a subtank unit in carriage, and arranges an ink cartridge out of said carriage, and feeds the ink of said ink cartridge to said recording head through ink supply passage with an ink supply means,

The ink jet recording device which established a bulb means by which it consisted of a subtank by which said subtank unit consists of flexible film, and an ink full detector which detects the ink full of this subtank, and said subtank could intercept said ink supply passage in the state of ink full.

[Claim 2] The ink jet recording device according to claim 1 which said bulb means consists of with the solenoid valve of a normal close format.

[Claim 3] The ink jet recording device according to claim 1 with which said bulb means operates according to the pressure of an ink supply means to feed ink.

[Claim 4] The valve mechanism of the ink jet recording apparatus according to claim 1 which carries out a switching action with the pressure to which it is constituted by the air pump with which said ink cartridge holds an ink bag in an airtight container, and is constituted, and said ink supply means makes pneumatic pressure act on said ink bag, and said bulb means acts on said ink bag further.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the ink jet recording device which records while supplying ink to a subtank and a recording head cyclically through passage from the ink cartridge which carried the ink jet type recording head and the subtank in carriage, and was installed in the box.

[0002]

[Description of the Prior Art] In order for dot density to become large by leaps and bounds with improvement in the engine performance of an ink jet type recording head, to attain color printing with natural color and to aim at improvement in much more printing quality, efforts to make the blot on a record medium small as much as possible are made. The emulsion which becomes ink from thermoplastics as the one means, and the approach of heating and carrying out film formation of the ink which was made to contain sugar and was breathed out on a record medium are proposed.

[0003] If it is in ink equipped with such film formation nature, since there are dramatically few blots Since melting fixation of the emulsion in ink is carried out by heating in addition to the merit that image quality improves substantially, while it has the merit that a high water resisting property is obtained, the concentration of the solid content under ink presentation is high, in order to receive the heat from a heating means further, the viscosity of ink tends to rise and there is inconvenience that the regurgitation property of ink becomes instability with the air bubbles generated according to temperature up.

[0004] In order to cancel such a trouble, connecting a recording head, a subtank, and an ink cartridge to endless, and circulating through ink is also proposed, but since two passage of the passage for outward trips and the passage for return trips is needed between a recording head and an ink cartridge, it has the problem that passage structure becomes complicated. In order to solve such a problem, the re-announcement No. 031335 [ 95 to ] official report sees, It has the ink feed hopper by which ink flows into two common ink rooms which are open for free passage on both sides of the pressure room of a recording head, and the ink room of each community from the exterior, respectively. One ink feed hopper is connected to a subtank, and the ink feed hopper of another side is connected to the ink cartridge. Make the ink of an ink cartridge go via an ink jet type recording head, and ink is sent into a subtank. Discharged the air bubbles of a recording head on the subtank in this process, and the ink of the depths in which air bubbles do not exist was made to flow backwards from a subtank to an ink cartridge via a recording head, ink was supplied to the recording head, and the ink jet recording device printed while circulating ink was proposed. According to this, without causing complication of structure, the temperature up of viscosity lifting by the recording head or a recording head can be prevented as much as possible, and stable record can be performed.

[0005]

[Problem(s) to be Solved by the Invention] However, in order to perform record which absorbed the pressure fluctuation of the ink accompanying migration of carriage, and was stabilized, a subtank fabricates the flexible film to saccate, and is constituted. In order that the ink in a subtank may flow backwards to an ink cartridge according to a gravity difference, i.e., a siphon phenomenon, by non-operating status on the other hand, It will be in the condition that the films which constitute a subtank stuck through the thin ink layer between long period of times. When it is further left in this condition for a long period of time, moisture evaporates through the flexible film which constitutes a subtank, films fix, and the ink of passage from a subtank to [ the solid content of ink is condensed and ] a head solidifies, and there are problems, like clogging arises.

[0006] It is offering the ink jet recording device which this invention's can be made in view of such a technical problem, and the place made into the object can make able to hold the ink of the amount which can be printed on a subtank also in the condition of not working, and can prevent the failure by prolonged neglect.

[0007]

[Means for Solving the Problem] In order to attain such a technical problem, it sets to this invention. In two common ink rooms which are open for free passage on both sides of a pressure generating room, and the ink room of said the community of each, each The ink jet type recording head equipped with the ink feed hopper linked to the exterior, In the ink jet recording device which carries a subtank unit in carriage, and arranges an ink cartridge out of said carriage, and feeds the ink of said ink cartridge to said recording head through ink supply passage with an ink supply means A bulb means by which it consisted of a subtank by which said subtank unit consists of flexible film, and an ink full detector which detects the ink full of this subtank, and said subtank could intercept said ink supply passage in the state of ink full was established.

[0008]

[Embodiment of the Invention] Then, based on the example illustrating the detail of this invention, it explains below. Drawing 2 shows one example of the recording apparatus of this invention, a recording head 1 and the subtank unit 30

are carried in carriage 2, and the driving means which is not illustrated performs a both-way scan (horizontal scanning). The platen 10 arranged in the location which counters a recording head 1 on the other hand rotates by the driving means which is not illustrated, and, on the other hand, conveys in a direction the recording paper 12 which is a record medium (vertical scanning). Synchronizing with the above horizontal scanning and vertical scanning, based on record data, an ink droplet is made to adhere on discharge and the recording paper 12, and predetermined record is performed from a recording head 1.

[0009] While the blot by space is prevented because the front face of the emulsion which is thermoplastics contained in ink fuses and combines the ink droplet recorded on the recording paper 12 while the moisture in ink evaporates quickly in response to the heat supply from the platen 10 heated at the heater 11 which is a heating means, a water resisting property is raised. Although heat transfer is carried out also to the recording head 1 which faces a platen 10 at this time, in addition to cooling by the ventilating fan which is not illustrated, this heat is cooled in the ink which flows ink to the recording head 1 interior.

[0010] Next, drawing 1 explains the passage configuration of the ink jet recording device of this invention. Although this example is the configuration of performing color record using the ink of four colors, it is the configuration of branching the air from a single air pump to four lines, and performing ink circulation for every system, and shows only one only of lines [ them ] by drawing 1.

[0011] Two common ink rooms 4 and 5 which a recording head 1 opens for free passage on both sides of the pressure room 3, It has the ink feed hoppers 6 and 7 by which ink flows into the ink rooms 4 and 5 of each community from the exterior, respectively. The ink feed hopper 7 of another side is connected to the subtank 32 by which one ink feed hopper 6 constitutes the subtank unit 30 again at the ink cartridge 41, and ink flows cyclically via the pressure room 3 according to the pressure differential produced in the common ink rooms 4 and 5.

[0012] The flexible supply tube 51 is connected to the ink feed hopper 7 by the side of a cartridge 41, and the passage bulb 52 which is a bulb means is connected to the other end of the supply tube 51. Opening of traffic of passage is made by energization to an internal solenoid, and the passage bulb 52 of this example is constituted by the so-called normal close type with which passage is intercepted in the state of un-energizing of solenoid valve.

[0013] The passage bulb 52 is further connected to an ink cartridge 41 via a tube 54 and the tubular needle 53. Via the pressure regulator 62, the air pump 61 which is an ink supply means branches to four lines, and is connected to the ink cartridge 41 via the air pipe 64 from the change bulb 63. According to such structure, it energizes on the passage bulb 52 at the time of initiation of record actuation, and passage is opened, and an air pump 61 is operated, and ink is cyclically supplied to a recording head 1 by things.

[0014] On the other hand, the subtank unit 30 is equipped with the subtank 32 constituted with the flexible film as shown in drawing 3, and the volume changes with deformation of a film according to the amount of ink. The ink full detector 141 which detects ink full, and the ink low detector 142 which detects INKUEMPUTI are formed in the subtank 32. The ink full detector 141 consists of photoluminescence photo detector pairs. A detecting signal is outputted when the detection plate 140 which is the tabular spring object arranged so that the front face of the subtank 32 might be met intercepts an optical axis. Moreover, the ink low detector 142 The \*\*\*\*\* photoluminescence photo detector pair constitutes the subtank 32, and when the ink of the subtank 32 which has light transmission nature decreased in number and the quantity of light to penetrate increased, it is constituted so that a signal may be outputted.

[0015] When the ink full of the subtank 30 is detected, the energization to the change bulb 63 is turned off by the control circuit which is not illustrated. as three so-called directional valves by which the change bulb 63 is opened for free passage by energization with an air pump 61, a free passage with an air pump 61 is intercepted, and a cartridge 41 is further opened for free passage with atmospheric air at the time of un-energizing -- a configuration -- now, it is.

[0016] As an ink cartridge 41 is shown in drawing 4, the ink bag 43 is held in the airtight box 42, and the air pipe 64 is connected to the airport section of a box 42. Thereby, if the interior of a box 42 becomes atmospheric pressure, the ink in the ink bag 43 will flow backwards to a cartridge 41 via a recording head 1 while the ink of the subtank 30 is supplied to a recording head 1 with the water head difference H shown in drawing 1, since it becomes equal to atmospheric pressure as much as possible.

[0017] Next, if detected by the ink empty \*\* ink low detector 142 of the subtank 32, the energization to the change bulb 63 will be made and the box 42 of an ink cartridge 41 will be opened for free passage by the air pump 61. A pressure is adjusted so that ink may leak by the pressure regulator 62 and it may not come out of the pressure from an air pump 61. The ink in the ink bag 43 is pressurized by this pressure, and the ink of the ink bag 43 is supplied to a recording head 1 through the supply tube 51, and is supplied also to the subtank 32 via here. And if the ink full of the subtank 32 is detected by the ink full detector 141, the energization to the change bulb 63 will be severed and supply of ink will stop. Henceforth, during record actuation, the above-mentioned actuation winds based on the signal from detectors 141 and

142, and \*\*\*\*\* ink is supplied cyclically.

[0018] On the other hand, when record actuation is completed, it energizes on the change bulb 63 and ink is pumped up on the subtank 32, and when the ink full of the subtank 32 is detected, energization of the passage bulb 52 is turned off. This intercepts the passage where the passage bulb 52 connects a recording head 1 and an ink cartridge 41. The ink with which the siphon phenomenon by the water head difference H of the subtank 32 and an ink cartridge 41 was prevented, and the subtank 32 was filled up by this stagnates on the subtank 32, without flowing backwards to an ink cartridge 41.

[0019] According to this, since the ink of an ink full EQC remains on the subtank 32 also in prolonged future neglect, even if that of the subtank 32 arises, solid content concentration lifting is mitigated, and it is prevented effectively that blinding and films therefore fix.

[0020] Since passage is intercepted by it when a power source is disconnected by the reason which is not expected [ interruption to service ] during record actuation since the passage bulb which is furthermore a bulb means consists of a normal close type solenoid valve, operation that ink is held is in a subtank.

[0021] Moreover, since the ink of the amount which corresponds in a subtank at ink full is held also when resuming record actuation again, it also has the merit that record actuation can be started immediately.

[0022] Drawing 5 shows the second example of the ink jet recording apparatus of this invention, and the valve in which air actuation is possible constitutes passage bulb 52' prepared in the ink supply tube 51 in this example.

[0023] Drawing 6 (a) shows one example of passage bulb 52', and is arranging four passage in a single unit in an example, and each system operates similarly. It is a valve 154, and while a part for a shank is supported by casing 156 possible [ a slide ], in the state of usual, it is energized with a spring 153, and is pressed by packing 154. Immobilization of a spring 153 and the free wheel plate 151 with a tube 51 which has the role of connection are fixed to the upper part of casing 156. Moreover, an end connection with the tube 54 which leads to an ink cartridge side is constituted by the casing 156 lower part in one.

[0024] The flexible film 157 is arranged by lower opening of casing 156 so that path clearance (c shows to drawing 6 (b)) may be formed to the actuation shaft of a valve 154. Although the flexible film 157 is possible also for using rubber etc., in this example, the laminate film which joined the polyethylene film which is thermoplastics further to the film with which the flexible film vapor-deposited aluminum on the PET film is used. According to this example, it is more effective, when the flexible film 157 can be joined to casing 157 by heat joining and transparency of moisture or air carries out trespass prevention further.

[0025] In addition, since ink flows up as the arrow head a of drawing 6 (a) shows by application of pressure, a gas remains and is suitable for it to the interior of the passage bulb 52. Under the plasticity film 157, it consists of rubber material, covering 159 is arranged through the diaphragm 158 with which the pressure receiving section 161 was formed in one, and a chamber 160 is formed. The airport to a chamber 160 is formed in covering 159 in one, and as shown in drawing 5, it connects with the branching plate 66 through the by-path pipe 65.

[0026] In this example, the inside of a chamber 160 is maintained by the atmospheric pressure during a halt of an air pump 61, and since the flexible film 157 and path clearance were maintained, as the actuation shaft of the valve 154 energized by the spring 153 was shown in drawing 6 (b), the passage of ink is intercepted.

[0027] If an air pump 61 is operated, the inside of a chamber 160 will be pressurized and a diaphragm 158 will receive an equal load with a pressure. This equal load serves as energization force according to the area of the pressure receiving section 161, a diaphragm 158 displaces, and it is energized by the actuation shaft of a valve 154 through the flexible film 157, and a valve 154 resists the energization force of a spring 153, and moves up, and as shown in drawing 6 (c), Kaisei of the passage is carried out.

[0028] Therefore, Kaisei of the passage is carried out only in operating an air pump 61 at the time of initiation of record actuation, and ink circulation is performed. Moreover, when record actuation is completed, by stopping an air pump 61, the ink supply passage 51 which connects an ink cartridge 41 with a recording head 1 can be blockaded, and suppose un-working in the condition of having made the subtank 32 storing ink for a long period of time.

[0029]

[Effect of the Invention] Two common ink rooms which are open for free passage on both sides of a pressure generating room according to this invention, In the ink room of each community, each The ink jet type recording head equipped with the ink feed hopper linked to the exterior, In the ink jet recording device which carries a subtank unit in carriage, and arranges an ink cartridge out of carriage, and feeds the ink of an ink cartridge to a recording head through ink supply passage with an ink supply means It consists of a subtank by which a subtank unit consists of flexible film, and an ink full detector which detects the ink full of a subtank. Moreover, since a bulb means by which a subtank could intercept ink supply passage in the state of ink full was established, the condition of having filled up the subtank with the ink of the amount of conventions can be maintained for a long period of time, and it can prevent that the ink of a

[Drawing 1] It is drawing showing the passage configuration which shows one example of the ink jet recording device of this invention.

[Drawing 3] It is the assembly perspective view showing one example of the subtank of a recording apparatus same as the above.

[Drawing 4] It is the sectional view showing one example of the ink cartridge of a recording apparatus same as the above.

[Drawing 5] It is the passage block diagram showing the second example of this invention.

[Drawing 6] Drawing (a) Or (c) is the assembly perspective view and sectional view showing one example of the bulb means of a recording apparatus same as the above, respectively.

## 1 Recording Head

## 2 Carriage

### 3 Pressure Room

#### 4 5 Common ink room

### 6 Seven Ink feed hopper

## 10 Platen

### 30 SubTank Unit

### 32 SubTank

## 41 Ink Cartridge

## 51 Supply Tube

### 52 Passage Bulb (Bulb Means)

### 61 Air Pump (Ink Supply Means)

[Procedure amendment 2]

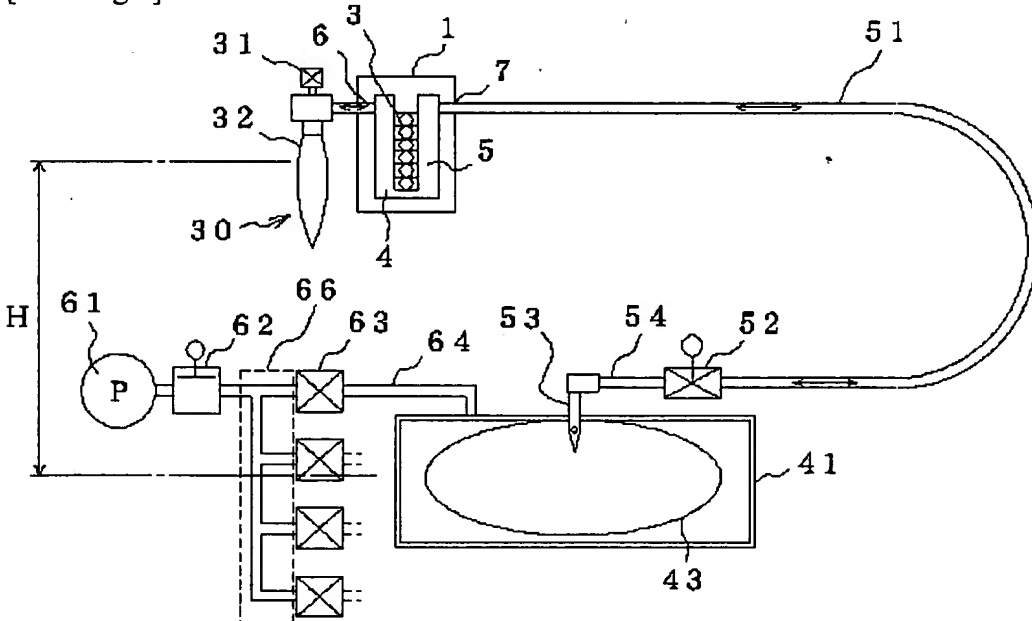
[Document to be Amended] DRAWINGS

[Item(s) to be Amended] drawing 1

[Method of Amendment] Modification

[Proposed Amendment]

[Drawing 1]



**[Procedure amendment 3]**

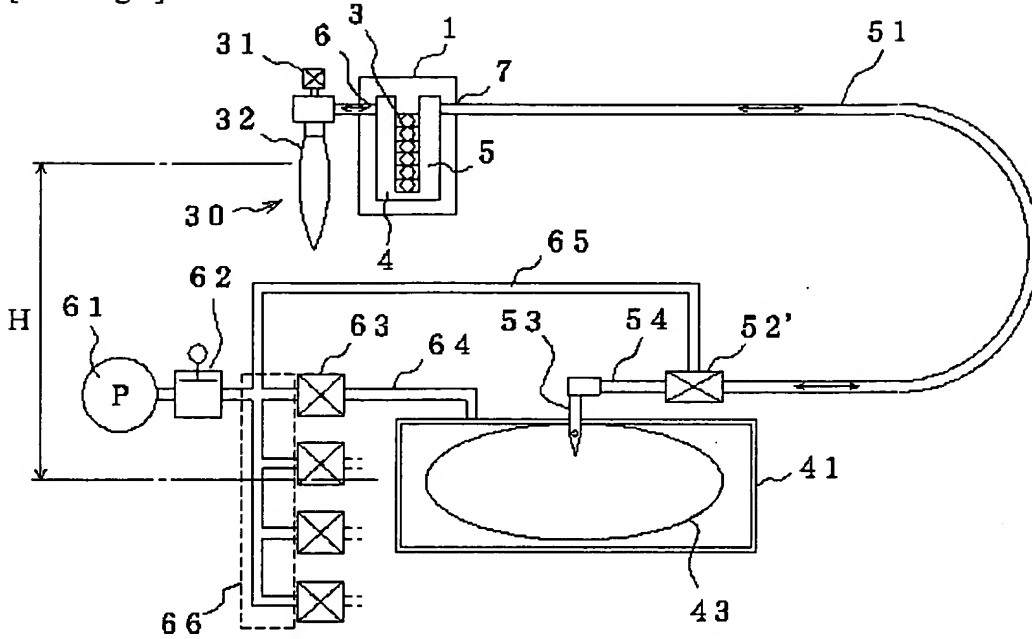
[Document to be Amended] DRAWINGS

[Item(s) to be Amended] drawing 5

[Method of Amendment] Modification

**[Proposed Amendment]**

[Drawing 5]



[Procedure amendment 4]

[Document to be Amended] DRAWINGS

[Item(s) to be Amended] drawing 7

[Method of Amendment] Deletion

[Translation done.]